

Patent Application
Docket No. UHK.118XT
Serial No. 10/648,158

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner : Richard R. Shaffer
Art Unit : 3775
Applicants : Kenneth M.C. Cheung, Kelvin W.K. Yeung, C.Y. Chung,
William W. Lu
Serial No. : 10/648,158
Conf. No. : 3550
Filed : August 25, 2003
For : Device for Correcting Spinal Deformities

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF KENNETH MC CHEUNG UNDER 37 CFR §1.132

Sir:

I, Kenneth Cheung, hereby declare:

THAT, I am Clinical Professor; Deputy Chief, Division of Spine Surgery, LKS Faculty of Medicine, The University of Hong Kong; Honorary Consultant Orthopaedic Surgeon, Department of Orthopaedics & Traumatology, Queen Mary Hospital, 102 Pokfulam Road, Hong Kong, SAR, China; and am an inventor on this application;

THAT, my qualifications are set forth in more detail in the copy of my Curriculum Vitae attached hereto as Exhibit 1;

THAT, I have reviewed the Office Action mailed December 10, 2008, in the application referred to above;

And being thus duly qualified, do further declare as follows:

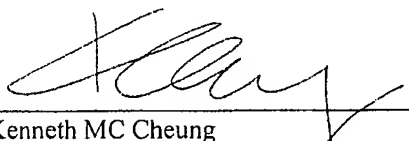
1. Drewry '527 is entitled "Flexible Spinal Stabilization System and Method" and is primarily concerned with novel anchors and coupling members that can be used in connection with known flexible elongated tethers for dynamic stabilization of spinal motion segments. Although many of the same words found in Drewry are also found in my application, a careful reading of the reference makes clear that Drewry does not teach or suggest any device or method useful for correcting spinal deformities such as scoliosis, kyphosis, or lordosis.

2. A skilled artisan would readily recognize that Drewry's device and method is directed to stabilizing otherwise weakened or unstable motion segments of the spine "that compromise its load bearing and support capabilities. Such pathologies of the spine include, for example, degenerative diseases, the effects of tumors and, of course, fractures and dislocations attributable to physical trauma." (Drewry, column 1, lines 14-18). "Stabilization" is repeatedly used throughout the reference, clearly indicating its primary function. Drewry's invention is particularly directed to stabilizing spinal motion segments to resolve problems affecting disc tissue between vertebrae (see column 1, lines 21-50). At column 1, lines 44-49 Drewry specifies that his invention is directed to providing stabilization device and methods that "allow segmental motion to be maintained after attachment" to the spinal motion segment. At column 3, lines 56-59, Drewry specifies that his stabilization system "allows at least small degrees of spinal motion in the spinal motion segment to which it is attached since system 20 includes an elongate member 80 that is at least partially flexible between adjacent anchors 30." (emphasis added). Drewry's system is known as DYNESYS, and is clearly described in the publication "Dynesys® Dynamic Stabilization System: A Guide for Patients" attached hereto as Exhibit 2. The fact that Drewry's stabilization device and method requires flexibility between adjacent anchors, coupled with the fact that Drewry's elongated tether is taught to be made of polyester or polyethylene or suture as alternatives to superelastic materials makes clear to one skilled in the art that this is a method for stabilizing weakened or unstable portions of the spine. In fact, Drewry's DYNESYS system is already in clinical use as an adjunct to fusion to treat degenerative slipped discs (spodylolisthesis) in the thoracic, lumbar or sacral regions when there is evidence of resulting neurologic impairment or in the case of a previous failed fusion (pseudarthrosis).

3. In contrast to Drewry's teachings, my claimed invention is a method of correcting stable spinal deformities such as scoliosis and deformities of kyphosis or lordosis. None of these are mentioned anywhere in Drewry, and one of ordinary skill in the art would find no teaching or suggestion of how to correct such stable spinal deformities in Drewry. Accordingly, while Drewry uses many of the same words as are found in my application, when taken in their proper context and the reference is read as a whole, it is clear to one skilled in the art that Drewry is addressing a completely different problem from that solved by my invention.

4. I declare further that all statements made in this Declaration of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the specification or any patent issuing thereon.

Dated: 31 March 2009


Kenneth MC Cheung

Attachments: Exhibit 1 (Curriculum Vitae)

Exhibit 2 (Publication "Dynesys® Dynamic Stabilization System: A Guide for Patients")

CURRICULUM VITAE of CHEUNG MAN CHEE, KENNETH

CURRENT APPOINTMENT: Clinical Professor
Honorary Consultant Orthopaedic Surgeon
Deputy Chief, Division of Spine Surgery

ADDRESS: Department of Orthopaedics & Traumatology
Queen Mary Hospital
The University of Hong Kong
Hong Kong

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E-MAIL: cheungmc@hku.hk

QUALIFICATIONS:

MB.BS (London)	1987
FRCS (England)	1991
FHKAM (Orthopaedic Surgery)	1995
FHKCOS	1995
MD (The University of Hong Kong)	2007

GENERAL EDUCATION: Sevenoaks School
1975 TO 1982 Sevenoaks, Kent, U.K.

MEDICAL EDUCATION: The Medical College of St. Bartholomew's Hospital
1982 TO 1987 University of London, U.K.

**POSTGRAUATE TRAINING
IN SPINE SURGERY:** Multiple centers in Japan, USA, UK, France and Germany
between May to Oct 1996.

**POSTGRAUATE TRAINING
IN MOLECULAR BIOLOGY
AND GENETICS:** Department of Biochemistry, The University of Hong Kong.
Jan to Dec 2002.

RESEARCH AND SCHOLARSHIP

PRIZES AND AWARDS:

A) Personal

- 1) Ten year follow-up of lower thoracic hemivertebrae treated by convex fusion and concave distraction. *Arthur Hodgson best clinical paper award*. Annual meeting of the Hong Kong Orthopaedic Association. Hong Kong, 2000.
- 2) Association of Lumbar Disc Degeneration with Type IX collagen polymorphisms in Chinese. *Best paper award*. Annual meeting of the International Society for the Study of the Lumbar Spine, Vancouver, Canada, 2003.
- 3) A novel Sr-HA bioactive bone cement for vertebroplasty. *Moe basic science poster award*. Annual meeting of the Scoliosis Research Society, Quebec City, Canada, 2003.
- 4) Delivery of bone morphogenetic proteins 2 and 4 by use of adeno-associated viral gene therapy. *Best basic science paper award*. Annual meeting of the Hong Kong Orthopaedic Association. Hong Kong, 2003.
- 5) Finalist for *Hibbs Basic Science Award* of the Annual meeting of the Scoliosis Research Society 2003 and 2004 - for work on genetics of degenerative disc disease, primate pinealectomy model and scoliosis, and stem cell regeneration of the intervertebral disc.
- 6) *Scoliosis Research Society Traveling Fellowship* (May 2004) – competitive international fellowship program organized by the (International) Scoliosis Research Society. Traveled to centers in Montreal, Baltimore, Charlottesville, Chicago, St Louis, Minneapolis and San Diego.
- 7) *SICOT 3rd Best Oral Presentation Prize* - The effect of pinealectomy on scoliosis development in young non-human primates. Istanbul, Turkey 2005.
- 8) *Third-Class Prize in Natural Sciences* - Repair of articular cartilage defects by bone marrow derived mesenchymal cells combined with hydroxyapatites-glycolic acid composite. 2004 - 2005 by the municipality of Suzhou (Certificate number: 321).
- 9) *Honorary Visiting Professor*- The Fourth Military Medical University, Xian, China (from Jan 2007).
- 10) *Honorary Visiting Professor*- The Second Military Medical University, Shanghai, China (from March 2008).

- 11) **Henry Farfan Award (North American Spine Society):** 2008 - for outstanding contributions in spine related basic science research.
- 12) **Honorary Life Member, North American Spine Society** - in recognition of dedication to the field of spine care and research, Oct 2008.

B) By research team (as supervisor)

- 1) The possibility of using chemonucleolysis in the treatment of scoliosis - an in vivo rabbit experimental study. **The Best Poster Award** (Dr. DS Lu), Annual International Conference of the SICOT, Paris, France, 30 August -1 September 2001
- 2) A minimal invasive approach for anterior release in scoliosis correction using chemonucleolysis - spinal flexibility increase after chymopapain injection is dosage-dependent. **The Best Paper Award for Associate** (Dr. DS Lu), 21st Annual Congress of the Hong Kong Orthopaedic Association, Hong Kong, 10-11 November 2001.
- 3) Invention of a new spinal implant for gradual scoliosis correction. **Best paper award for an Associate Fellow** (Mr. Kelvin Yeung). Annual meeting of the Hong Kong Orthopaedic Association. Hong Kong, 2003.
- 4) Novel bioactive bone cement for spinal surgery. **Best oral presentation award** (Dr. William Lu). Second SICOT/SIROT International Annual Conference. Cairo, Egypt, 2003.
- 5) Superelastic implant for scoliosis correction (用於脊柱側凸矯形的新型超彈性鎳鈦記憶合金植入性器械). **2nd prize at the 8th challenge cup for Scientific Innovation.** (Mr. Kelvin Yeung). Organised by the Ministry of Science and Technology and Ministry of Education, The People's Republic of China. 2003
- 6) Champion (1st prize) – **Best Student Papers Competition** (Mr. Jacky Wong). Bone formation and mechanism leading to osseointegration of strontium-containing hydroxyapatite bone cement. Biomedical engineering conference BME 2004, 23rd to 25th Sept 2004.
- 7) The effects of cyclooxygenase -2 selective non-steroidal anti-inflammatory drugs (NSAIDS) in fracture repair. **Best basic science paper award** for Associate Member (Ms Cathy Guo), 24th Annual Congress of the Hong Kong Orthopaedic Association, Nov 2004.

- 8) The role of cyclooxygenase 1 and 2 in bone repair. **Webster Jee Young Investigator Award** (Ms Cathy Guo). Second International Conference on Osteoporosis and Bone Research, Chengdu Oct 19-23, 2005.
- 9) Comparison of the effect of non-selective NSAID and Cyclooxygenase-2 (COX-2) Selective NSAID on bone formation -- Implications for Spinal Fusion. **Moe basic science poster award**. (Ms Cathy Guo). Annual meeting of the Scoliosis Research Society, Miami, USA, Oct 2005.
- 10) Winner of **Young Scientist Award 2005** by Dr. Kelvin Yeung for his thesis on the "Development of a Novel Spinal Implant for Progressive Scoliosis Correction". Awarded by The Hong Kong Institute of Science, Hong Kong Oct. 2005
- 11) The role of cyclooxygenase 1 and 2 in bone repair. **Best basic science paper award** for Associate Member (Ms Cathy Guo), 25th Annual Congress of the Hong Kong Orthopaedic Association, Nov 2005.
- 12) Nano Biomechanics of Type II Collagens in Human Intervertebral discs. **Best Young Engineers Papers Competition** (D.K. Aladin), BME Conference 2006 (Hong Kong).
- 13) Bone Composition and Crystal Structure after Strontium Treatment for Osteoporosis Goat Model. **Young Investigator Award** (Raymond Lam Wing-Moon), 8th Regional Osteoporosis Conference, The Osteoporosis Society of Hong Kong. 18th-20th May, 2007. Hong Kong.
- 14) Linkage analysis on familial early-onset degenerative disc disease. **Best Poster Award**. (Daniel WH Ho) 34th Annual Meeting of International Society for the Study of the Lumbar Spine, Hong Kong. June 10-14, 2007.
- 15) Association of Trp2 Allele with Changes in Morphology and Nano Mechanics of the Human Intervertebral Disc Collagens. **Best Basic Science Paper Award**. Aladin KD, Lu WW, Cheung KMC, Ngan AHW, Chan D, Luk KDK. Hong Kong Orthopaedic Association Annual Congress, 17th-18th Nov 2007.
- 16) High Throughput Screening of Chemical Compounds for the Treatment of Osteoarthritis. Kiki YK Tsui, Victor YL Leung, Richard YT Kao, Danny Chan, Koichi Masuda and Kenneth MC Cheung. **Best Poster Award**, 12th Research Postgraduate Symposium, The University of Hong Kong, Dec 2007.

- 17) Collagen-mesenchymal stem cell microspheres for regenerative medicine. Chan BP, Hui TY, Chan GCF, Chan D, Cheung KMC. **Best Oral Presentation Award**, World Forum for Spine Research, Kyoto 2008.
- 18) Age-related degeneration of lumbar intervertebral discs in rabbits revealed by Deuterium Oxide-assisted MRI. Leung VYL, Hung SC, Li LC, Wu EX, Luk KDK, Chan D, Cheung KMC. **Best General Poster Award**, World Forum for Spine Research, Kyoto 2008.

EDITORIAL BOARD OF REGIONAL AND INTERNATIONAL JOURNALS

A. International Journals

1. Deputy Editor-in-Chief of *Journal of Orthopaedic Surgery* (2004-2007)
2. Corresponding editor of *International Orthopaedics* (since 1999)
3. Corresponding editor of *Spine* (since 2000)
4. Corresponding editor of *US-China International Journal of Traumatology* (since 2003)
5. Editor of *INSPIRE* (since 2004).
6. Member of the medical review panel for *Evidence Based Spine Surgery Notes* distributed with Spine and European Spine Journal (March 05 – Sept 06).
7. Assistant Editorial Board of *European Spine Journal* (since 2005).
8. Editorial board of *European Cells and Materials* (July 2007 to July 2010).
9. Reviewer for *Journal of Orthopaedic Research* (2007 onwards)
10. Review Board member for *Orthopedics* (2007 onwards)

B. Regional Journals

11. Editor of *Hong Kong Journal of Orthopaedic Surgery* (since 2000).
12. Editor of *Hong Kong Medical Journal* (2000-Dec 2004).
13. Member of editorial board of *Journal of Orthopaedic Surgery and Research* (2006-)

C. Reviewer for Granting Bodies

14. Research grants council – 2007
15. Thrasher Research Fund (USA) – 2006
16. Scoliosis Research Society Research Grants – Since 2005
17. The University of Hong Kong, Faculty of Medicine – since 2006

RESEARCH INTERESTS

I have a major interest in basic and clinical research, and with the support of the previous faculty research fellowship, in 2002, I spent one year in the Department of Biochemistry to improve my understanding of genetics and molecular biology. Currently, with funding support from the Area of Excellence Program, our department has employed a partial teaching and service relief to allow me to spend 50% of my time in research.

My basic research interests are in 2 major directions. Firstly in relation to musculoskeletal biology with work on the genetics of intervertebral disc degeneration, stem cell regeneration of the intervertebral disc and molecular mechanisms of bone and cartilage formation. Objective evidence of success includes, funding by a number of competitive research grants from AoE, RGC and HKU foundation (see below), awards at international conferences (see earlier section), as well as publications in international journals.

My second major direction is in biomedical engineering and translational research, with the development of a Nickel-titanium implant for scoliosis correction and a bioactive cement for the treatment of osteoporotic fractures. I hold a number of full patents in both these materials. For the nickel-titanium implant, in collaboration with the City University of Hong Kong, we were successful in obtaining a RGC Central Allocation Vote (\$4.3 million) and also ITF (\$9 million) to further develop this material. We have also received support from an international implant company (Synthes) totaling HK\$1million for further clinical development of this implant material. For the bioactive bone cement, we have received \$4 million venture capital support from a subsidiary of Hung Lung Co. and with this, we were able to obtain China State Drug Administration approval. Within the next 1 to 2 years, we should be aiming to market this in mainland China and Hong Kong. Other evidence of success includes multiple publications in material science and clinical journals.

With this background in basic and translational research, I have been invited to co-chair the AOTK expert group in spinal deformities, an international advisory and development body, that provides guidance and feedback to AOSpine and Synthes in 2004, chairman of the AOSpine Research Commission in 2006 to 2009, and chairman of the Research Grant Committee of the Scoliosis Research Society in 2008. The main role is to coordinate research on a global level for these international organizations.

CURRENT GRANT SUPPORT***1) Competitive external research funding (as principal investigator)***

<u>Name of Investigator(s)</u>	<u>Project Title</u>	<u>Grant and Source(s) (HK\$)</u>	<u>Starting date</u>	<u>Expected Completion date</u>
KMC Cheung D Chan , RYT Kao YLL Leung K Masuda	Uncovering new compounds and mechanisms for treatment of intervertebral disc degeneration by Chemical Genetics	CERG (762608M) 867,685	2009	2011
KMC Cheung D Chan KSE Cheah V Leung	Roles and properties of notochordal descendent cells in the intervertebral disc	CERG 882,789	2008	2010
KMC Cheung D Chan VYL Leung R Kao	Uncovering new compounds and mechanisms for treatment of intervertebral disc degeneration by chemical genetics	CERG 376,500	2007	2008
KMC Cheung KDK Luk P Chu CY Chung WW Lu D Chan	Optimization and commercialization of novel metallic materials for orthopaedic use.	Guangdong-HK Technology Cooperation Funding Scheme 9,329,412	2006	2008
KMC Cheung D Chan EX Wu KDK Luk	Intervertebral disc regeneration by use of mesenchymal stem cells	CERG 1,221,914	2006	2009
KMC Cheung P Chu CY Chung KDK Luk WW Lu D Chan	Surface modification of Nitinol for Plasma Immersion Ion Implantation	(International) Scoliosis Research Society US\$100,000 HK\$778,450	2005	2007

KMC Cheung KDK Luk	Web-based outcome questionnaire and assessment for Scoliosis patients	Society for the Relief of Disabled Children 99,940	2005	2006
KMC Cheung WW Lu CY Chung P Chu KDK Luk	Feasibility studies of a new surface treatment of Nitinol to be used as an implant material	Synthes* 905,599	2005	2006
<i>*a leading global medical device company</i>				
KMC Cheung D Chan KSE Cheah WW Lu KDK Luk	The impact of the COL9A2 Q326W allele on inter-vertebral disc structure and degeneration	CERG 939,968	Jan 2005	Dec 2006
KSE Cheah KDK Luk KMC Cheung	Developmental genetics and skeletal research. (PI in Genetics of Degenerative Disc Disease)	AOE 50 million	April 2004	April 2009
KMC Cheung D Chan	Setting up of a Stem Cell research laboratory for musculoskeletal tissue engineering	HKU foundation seed grant 500,000	July 2003	Aug 2004
KMC Cheung KSE Cheah D Chan S P Yip KDK Luk JCY Leong	Genetic basis of low back pain in Chinese	CERG 1,513,000	2001	2004
KMC Cheung WW Lu J Chung KDK Luk	Gradual scoliosis correction by use of a new superelastic material	CERG 650,000	2000	2003
KMC Cheung KSE Cheah D Chan	The molecular basis of increased bone formation in transgenic mice expressing mutant collagen X	CERG 580,000	1999	2001
KMC Cheung KSE Cheah JG Andrew	The role of collagen X in bone fracture repair and non-union	CERG 783,090	1997	2000

2) University funded projects

KMC Cheung RYT Kao PK Chu D Yang KWK Yeung	Plasma ion implanted antibacterial surface coating for orthopaedic metallic implants	CRCG-HKU \$80,000	2008 June	2009 Dec
KMC Cheung GQ Zhou D Chan	MicroRNA expression and function in intervertebral disc cells	CRCG-HKU \$80,000	2007 March	2007 Dec
KMC Cheung P Chu KWK Yeung JCY Chung D Chan WW Lu	Development of novel plasma treated degradable metals for orthopaedic use	CRCG-HKU \$191,744	2006 Aug	2007 July
KMC Cheung YL Leung RYT Kao D Chan	New compounds for intervertebral disc regeneration by use of Chemical Genetics	CRCG-HKU \$120,000	2006	2007
KMC Cheung	A novel super-elastic surgical implant for spinal deformity correction	CRCG-HKU \$199,980	2004	2005
KMC Cheung D Chan	Intervertebral disc regeneration using mesenchymal stem cells: A rabbit model	CRCG 120,000	2002 Oct	2003 Sept

3) Competitive external research funding (as co- investigator)

<u>Name of Investigator(s)</u>	<u>Project Title</u>	<u>Grant and Source(s) (HK\$)</u>	<u>Starting date</u>	<u>Expected Completion date</u>
Chu PK Chan PCH Cheah KW Cheung KMC Ho AHP Luk KDK Surya C Wong M	Plasma Immersion Ion Implantation and Deposition System for Microelectronics, Optoelectronics, and Nanotechnology Research	CERG Special Equipment Grant 4,164,882	2008	2011
Chan BP Cheung KMC	Creating stable tissue interfaces for	ITF Tier 3	2008	2009

Luk KDK	bioengineered intervertebral disc segment			
Chan BP Chan D Chan GCF Cheung KMC Leung VYL Sze KY	A Novel Cell Delivery Technology – Injectable Collagen-Cell Microspheres for Intervertebral Disc Regeneration	CERG 760408M 1,110,847	2008	2011
KWK Yeung WP Yau KMC Cheung	Development of Novel Plasma Modified Metallic Materials for Anterior Cruciate Ligament Reconstruction	CERG 937,210	2008	2011
KWK Yeung B So KMC Cheung	Development of “SMART” internal spinal orthosis for immature scoliotic spine through the adoption of customized CAD/CAM system	Applied Research Grant (CityU) 1,260,000	2008	2011
HK Yip D Chan BP Chan KWK Yeung KMC Cheung G Chan	Study of the fate of mesenchymal stem cells in bone regeneration around titanium implants in mice.	CERG (780408M) 613,445	2008	2010
KWK Yeung KMC Cheung R Kao	Plasma Ion Implanted Anti-bacterial Surface Coating for Orthopaedic Metallic Implants	City University Strategic Research Grant 179,972	2008	2010
D Chan KMC Cheung KSE Cheah P Sham YQ Song et al.	Genome-wide identification and functional studies of genetic risk factors for low back pain and intervertebral disc degeneration	AOSpine 5M	2007	2012
K Yeung KMC Cheung P Chu JCY Chung KDK Luk	Development of Novel Biodegradable Metallic Materials for Orthopedics	CERG 739,200	2007	2010

P Chu P Chan KW Cheah KMC Cheung A Ho KDK Luk et al.	Plasma Immersion Ion Implantation and Deposition (PIII&D) Equipment	RGC central allocation equipment 2.8M CityU 1/06C	June 2007	June 2009
WW Lu B Xu, PKY Chiu KDK Luk AHW Ngan KMC Cheung JCY Leong WK Chan	Optimization and commercialization of strontium containing bioactive bone cement for various orthopaedic applications	ITF-HK Guangdong 5.569M	2007	2009
B Chan D Chan GCF Chan KMC Cheung KY Sze	Collagen biomaterial and bone marrow derived mesenchymal stem cell (MSCs) based therapy – Second generation tissue engineering solutions for cartilage repair. GHP/050/06	ITF-HK Guangdong 2.9M	2007	2009
WW Lu AHW Ngan KMC Cheung KDK Luk	The micro-structure and micro-mechanics of human intervertebral disc HKU 7153/06E	CERG 490,000	1/12/2006	30/11/2008
PK Chu CY Chung KMC Cheung KDK Luk	Development of Commercial Plasma-Treated Orthopedic Implants with Shape Memory and Super-Elastic Properties	Applied Research Grant (CityU) 1,140,000	2006	2008
D Fong KMC Cheung KDK Luk JCY Cheng B Ng PSF Yip	Cost and clinical effectiveness of the Hong Kong scoliosis screening HKU 7006-PPR20051	CERG (public policy research) 710,000	1/4/2006	31/3/2008
B Chan KMC Cheung W Lu M Wang D Chan KDK Luk	A Novel Photochemically Crosslinked Collagen Scaffold for Intervertebral Disc Replacement	CERG \$818,957	2005	2007

KF So					
P Chu KDK Luk KMC Cheung WW Lu SC Tjong CY Chung D Chan QP Sun	Development of Novel Materials for Orthopedics	CERG CAV \$4.14M	2005	2008	
D Chan KMC Cheung KSE Cheah	Genomic analysis of the regulation of osteoblast activity in a mouse with generalized hyperostosis	CERG \$939,968	2004	2006	
YQ Song KMC Cheung KDK Luk D Chan KSE Cheah P Sham	Genetic linkage analysis of early onset degenerative disc disease in Southern Chinese	CERG 786,000	2003	2006	
D Chan KMC Cheung KSE Cheah	Defining molecular mechanisms underlying growth plate abnormalities in Schmid metaphyseal chondrodysplasia by targeted mutagenesis in mice	CERG \$650,000	2000	2002	
KSE Cheah KMC Cheung D Chan JD Huang DKY Shum	Molecular genetic and biochemical analyses of hereditary bone tumours (osteochondromas/exostosis) in Chinese	NSFC/RGC 800,000	2000	2003	
JCY Leong KMC Cheung KDK Luk YG Hu A Carl	The role of the pineal gland in the causation of scoliosis: a bipedal rhesus monkey model	CERG 921,150	1999	2002	
KDK Luk DS Lu KMC Cheung JCY Leong	A minimally invasive approach to anterior release in scoliosis by chemonucleolysis: An experimental study with the rabbit scoliosis model	CERG 1.4 M	1998	2002	

KDK Luk,
KMC Cheung
DHK Chow
JCY Leong
WW Lu

A comprehensive, objective
study of the cause, effect, and
methods of prevention of
occupationally-related low
back pain

CERG
692,000

1996

1999

INVITED SPEAKER AND VISITING PROFESSORSHIPS

A) International

- 1) Mouse models for the study of bone fracture repair: International symposium on the formation and repair of extracellular matrix, Hong Kong. October, 1996.
- 2) Instrumentation in TB Spine and Management of Spinal Metastases. The 4th combined meeting of the Spinal and Paediatric section of WPOA and The 21st annual meeting of the Royal College of Orthopaedic Surgeons of Thailand and the Thai Orthopaedic Association. Pattaya, Thailand. October 1999.
- 3) Thoracoscopic Spinal Surgery. 7th World Congress of Endoscopic Surgery. 1st to 3rd June 2000. Singapore. Speaker and moderator.
- 4) Genetic basis of degenerative disc disease. 7th International Interbody Technology meeting, HK. 29th to 30th Mar. 2001.
- 5) Genetic basis of degenerative disc disease in Asians and The role of the pineal gland in scoliosis development in chickens and primates. The 5th combined meeting of the Spinal and Paediatric section of APOA, Singapore. Nov 2002.
- 6) Adolescent idiopathic scoliosis and Management of spinal metastases. International Spine Workshop. Jinan, Shandong, China. 13th to 14th March 2003.
- 7) Management of Osteoporotic Spine Fractures. Visiting Professor to Zibo Orthopaedic Hospital, Shandong, China. 15th to 17th March 2003.
- 8) TB deformities. AO International Spine Course, Davos, Switzerland. Dec 2003.
- 9) Vertebroplasty by use of a Bioactive Bone Cement. Scoliosis Research Society Annual Pre-meeting Course, Buenos Aires, Argentina. Sept 2004.
- 10) Genetic and MRI findings in degenerative disc disease. AOSpine European Region Meeting. The Lumbar Intervertebral Disc, Davos, Switzerland: 17th to 20th Mar 20 2005.
- 11) Genetics of Intervertebral Disc Degeneration. Plenary speaker for the 9th Seminar of The Study Group for Nerve and Spine, Hakone, Japan. 19th to 20th March, 2005.
- 12) Genetics of Intervertebral Disc Degeneration and Novel Implant for Gradual Scoliosis Correction. Guest lecturer, Department of Orthopaedic Surgery, Tokai University Medical School, Japan. 22nd March 2005.
- 13) Invited faculty for live surgery demonstration. Asia-Pacific Orthopaedic Association Operative Spine Course, 7th to 10th April 2005. Beijing, China.

- 14) Genetics of Degenerative Disc Disease. Invited speaker, European Cells and Materials Symposium (ECMVI): Spinal Motion Segment: From Basic Science to Clinical Application, 4th to 7th July, 2005. Davos, Switzerland.
- 15) Faculty AOSpine Advanced Spine Course, Phuket, Thailand. 16th -18th March 2006. (Topics: anterior approaches to cervical spine, en-bloc spondylectomy, recent advances in treatment of severe pediatric scoliosis).
- 16) Faculty for Recent Advances in Spine Surgery, Malmo, Sweden, 27th-28th April 2006. Memory alloy technology and disc transplantation.
- 17) Faculty for The Lumbar Intervertebral Disc, Current Concepts in Non-Fusion Technology, Denver, 29th-30th April 2006. Topics: Genetics of degenerative disc disease and MRI findings in DDD.
- 18) Visiting Professor – Hospital das Clinicas da Faculdade de Medicina de Ribeirao Preto, University of Sao Paulo, Brazil. 20th to 21st September, 2006. Topics: genetics and spinal implants.
- 19) Instructional course lecturer – Conjoint scientific congress of the Royal College of Surgeons of Edinburgh and College of Surgeons of Hong Kong. Hong Kong. 12th October, 2006. Lecture on “TB Spine – State of the Art”.
- 20) Invited speaker – AOSpine Course, Tokyo, Japan. 12th to 14th October, 2006. Talks on “How I do it – posterior surgery for scoliosis” and “Rheumatoid arthritis of the upper cervical spine”.
- 21) Faculty AOSpine Advanced and Masters Courses, in Davos, Switzerland. Dec 2006. Talks on lumbar disorders and intervertebral disc degeneration and regeneration.
- 22) Invited faculty for live surgery demonstration. Asia-Pacific Orthopaedic Association Operative Spine Course, 8th to 11th March 2007. Coimbatore, India. Lecture topic: Natural history and classification of Adolescent Idiopathic Scoliosis.
- 23) Invited faculty, AOSpine Intervertebral Disc Course: The Past, The Present, The Future. Curitiba, Brazil. 29th to 31st March, 2007. Lecture topics: (1) Spine research network, (2) The biology of intervertebral disc degeneration and regeneration.
- 24) Invited speaker to Scoliosis Research Society World Wide Regional Course, Beijing, China. 4th to 6th April, 2007. Lecture topics: (1) Assessment and Management of TB and Pyogenic Spinal Infections, (2) Moderator and case presentations of Spinal Tumours Section.

- 25) Invited speaker to Combined meeting of the Society for Back Pain Research, UK and Finland and the 8th Physiatric Summer School. Helsinki, Finland. 28th to 29th June 2007. Lecture topics: (1) Genetics of Disc Degeneration, (2) Biologic Motion Preservation.
- 26) Invited speaker to Combined meeting of the ASEAN Orthopaedic Association and Vietnamese Orthopaedic Association, Ho Chi Minh City, Vietnam. Dec 5th – 7th, 2007. Lecture topics: (1) Recent advances in management of severe paediatric spinal deformities, (2) Management of tuberculous kyphosis.
- 27) Invited faculty to AOSpine International Davos Courses, Switzerland. Dec 9th – 14th, 2007. Lectures on (1) Management of spinal metastases, (2) Intervertebral disc regeneration, (3) Adjacent level degeneration, (4) Moderator for one symposium, one interactive workshop, and one case discussion session.
- 28) Organizing committee chairman and faculty member to World Forum for Spine Research, The Intervertebral Disc, Kyoto, Japan. Jan 24th to 26th, 2008. Lecture topic: Age related changes versus Degenerative Disc Disease.
- 29) Invited Speaker to Mayo Clinic Spine Symposium, Kauai, Hawaii. Jan 27th to 31st, 2008. Lecture topics (1) Anterior surgery for deformity correction, (2) Selection of fusion levels using the fulcrum bending radiograph, (3) Adjacent level degeneration, (4) Posterior versus combined excision of thoracolumbar and lumbar hemivertebrae.
- 30) Key Note Speaker at BritSpine 2008, 5th combined meeting. Belfast, Northern Ireland. April 30th to May 2nd 2008. (1) Tissue engineering of the intervertebral disc, (2) Genetics of Degenerative Disc Disease.
- 31) Invited Speaker to SIROT/SICOT Triennial Congress 2008, Hong Kong, 24th to 28th August, 2008. Topics (1) intervertebral disc regeneration, (2) Fusion level selection in AIS, (3) How has genetics altered our understanding of degenerative disc disease, (4) Management of metastatic spinal tumours.
- 32) Invited Speaker at 2nd International Symposium on Biotechnology in Musculoskeletal Repair. Lausanne, Switzerland. 2nd – 4th Oct 2008. “How has genetics research altered our understanding of Degenerative Disc Disease: Implications for intervertebral disc regeneration”.
- 33) Visiting Professor, Department of Orthopaedics and Spine Surgery, Ganga Hospital, Coimbatore, India. 23rd to 25th October, 2008. Topics (1) Relationship of back pain and MRI changes, (2) Adjacent segment degeneration, (3) Fusion level determination with

use of the fulcrum bending radiograph, (4) Surgical technique of posterior scoliosis correction, (5) Intervertebral disc regeneration, (6) Total en-bloc spondylectomy, surgical technique.

B) Local/Regional

- 1) Spinal Injuries. Hong Kong Physiotherapy Association. June, 1995.
- 2) Low Back Pain. Neuromuscular Disease Association, Hong Kong. April, 1997.
- 3) Screening and Bracing in Adolescent Idiopathic Scoliosis. Paediatric Orthopaedic Seminar, 60th Anniversary of Queen Mary Hospital and the 110th Anniversary of the Faculty of Medicine of the University of Hong Kong, May 1997.
- 4) The role of collagen X in fracture repair and non-union: A transgenic mouse model. 110th Anniversary Celebration Scientific Congress, The University of Hong Kong, Oct. 24-26, 1997.
- 5) Scoliosis screening. Department of Health continuing education program. Jan. 1999.
- 6) Anterior screw fixation of odontoid fractures. AOSpine Course, Hong Kong. April 1999.
- 7) Pyogenic infections of the Spine. AOSpine Course, Hong Kong. April 1999.
- 8) Spinal cord tumours, Orthopaedic Perspectives: Neurosurgical Nursing Association. July 1999.
- 9) Shandong Orthopaedic Training Course. May 2000. Invited speaker and surgical demonstration.
- 10) Advanced Spinal Orthopaedic Workshop, Hong Kong. 7th to 8th July 2000. Surgical approaches demonstration and moderator.
- 11) Management of chronic back pain. Medicolegal course on industrial back pain. 26th Nov 2000.
- 12) Thoracoscopic Spine Surgery. 1st Congress of Chinese Minimally Invasive Spine Surgery Symposium, Guangzhou. 28th to 29th April 2001.
- 13) Bone and Cartilage repair. HK Society of Endocrinology, Metabolism & Reproduction.. 27th May 2001.
- 14) Genetic basis of low back pain. The Medical Federation's Annual Scientific Meeting 10th June 2001.
- 15) Management of spinal metastasis; Osteoporotic Spine Fractures; Thoracoscopic Spine Surgery. Annual Spine Course at Peking Union Medical Hospital, Beijing. Nov 2001.

- 16) Surgical Management of Osteoporosis, from bench to bedside. Inaugural symposium of the osteoporosis society of Hong Kong, Dec 7th 2002.
- 17) Mrs Gordon Wu Visiting Professorship, The University of Hong Kong 2002-2003.
- 18) Neck Pain and its Management. HK College of Family Physicians - Annual Orthopaedic Update, 18th Jan 2003, Miramar Hotel.
- 19) Management of Adolescent Idiopathic Scoliosis, Management of Osteoporotic Spine Fractures. National Continuing Medical Course [The New Trends in Spine Surgery], 6th – 10th Oct 2003, Rui Jin Hospital, Shanghai.
- 20) Management of Osteoporotic Spine Fractures. 6th National Spine and Spinal Cord Injuries Continuing Medical Education Course, 11th – 12th Oct, 2003, Changsha, Hunan, China.
- 21) Application of High-Tech Materials for Medical Use. Seminar on Nano-materials and Technology by CK Yeung Worldwide Ltd., Hong Kong Nov 2003.
- 22) Commissioned training in Neurosurgery. Vertebral artery-Orthopaedic perspective. Neurosurgical society of HK. Jan 2004.
- 23) Osteoporotic vertebral fractures, Aetiology of Degenerative Disc Disease. AOSpine Advance Seminar, Hong Kong. 23rd to 25th October 2004.
- 24) Tissue engineering. Head and Neck Course 2005. Queen Mary Hospital. 23 June 2005.
- 25) Chinese Speaking Orthopaedic Society 2005 Spine Surgery Advanced Course & The second Chinese International Scoliosis Symposium. Tissue-engineered intervertebral disc replacement & TB deformities. 21-22 May 2005.
- 26) Visiting Prof. Zibo No. 7 Hospital. 20th May 2005. Talks on management of low back disorders.
- 27) Faculty AOSpine Advance Course, Hong Kong. 21st to 23rd Sept 2005. Talks on Odontoid fractures; Natural history and aetiology of AIS; Osteoporotic fractures; Thoracoscopic surgery.
- 28) International Spine Symposium, The Medical College of Qingdao University, Qingdao. 14th to 15th October, 2005. Talks on Management of TB Spine and Osteoporotic Spinal Fractures.
- 29) International Symposium on Spinal Deformities and Minimally Invasive Spinal Surgery, Changhai Hospital, Shanghai. 16th October, 2005. Selection of fusion levels using Fulcrum Bending Radiograph.
- 30) Hong Kong Orthopaedic Association Annual Congress, 19-20th November 2005. Management of severe pediatric spinal deformities.

- 31) Federation of the Medical Societies of Hong Kong, Annual Scientific Meeting, 10th June 2006. Interveterebral Disc Regeneration.
- 32) Stem Cell Workshop, The University of Hong Kong, 2nd -3rd Nov, 2006. Animal models of intervertebral disc regeneration.
- 33) 1st International Congress of Chinese Orthopaedic Association, Beijing, China. 13th to 15th Nov, 2006. Management of severe scoliosis in young children.
- 34) AOSpine Advance Course, 17th-19th Sept 2007. Hong Kong. Thoracic spine access and their complications.
- 35) Third international congress of spine deformity and non-fusion techniques, 14th -- 16th March 2008. Shanghai, China. Fusion level determination in scoliosis surgery.
- 36) Key Note Speaker – 2008 Chinese International Spine Forum, 28th – 29th March, 2008. Beijing, China. Topics: TB Kyphosis; Management of Spinal Metastases.
- 37) Invited speaker – 1st annual meeting of the Spine Deformity Study Group (China), 12th to 13th July, 2008. Xian, China. Topic: Combined anterior-posterior vs posterior hemivertebra excision.

PUBLICATIONS

A. REFEREED JOURNALS (*major contributions - as first or corresponding author*)*

*journal ranking, impact factor (IF) and citations are provided where available, based on the 2004 Science Citation Index.

1. Cheung KMC, Ruan D, Chan F L, Fang D: Computed tomographic osteometry of Asian lumbar pedicles: **Spine**, Vol. 19(13), 1495-8, July 1994. (Ranking: 3/42. IF: 2.299. Cited: 6)
2. Cheung KMC, Chow SP: Pigmented Villonodular Synovitis of the ankle: Correlation of clinical and MRI findings. **Journal of Orthopaedic Rheumatology**, Vol. 7(2), 117-121, June 1994.
3. Cheung KMC, Chow SP: Closed avulsion of both flexor tendons of the ring finger. **Journal of Hand Surgery (British & European Volume)** Vol. 20(1): 78-79, 1995. (Ranking: 31/41. IF: 0.494. Cited:3)
4. Peh WCG, Cheung KMC: Progressive shoulder arthropathy. **Annals of the Rheumatic Diseases**, Vol. 54(3): 186-173, March 1995. (Rank 4/22. IF: 3.916. Cited: 1)
5. Peh WCG, Khong PL, Cheung KMC: Imaging of tuberculosis of the extremities. **Hong Kong Medical Journal Supplement** Vol. 1(4): December 1995.
6. Peh WCG, Cheung KMC: Painful ankle swelling - diagnosis by MRI. **The British**

- Journal of Radiology**, Vol. 69(825): 881-882, September 1996. (Ranking: 53/84. IF:1.232)
7. Peh WCG, Cheung KMC: Tuberculosis of the hip joint. **International Medical Image Registry**, Vol. 2(5) : 109-110, 1996.
8. Cheung KMC, Luk KDK: Prediction of Correction of Scoliosis with Use of the Fulcrum Bending Radiograph. **J. Bone and Joint Surgery-Am**, Vol. 79(8), 1144-1150, August 1997. (Ranking: 5/42. IF:1.9. Cited:16)
9. Cheung KMC, Luk KDK, Leong JCY: Radiographic assessment of pedicle hook placement. **Spine**, Vol. 22(18), Sept 1997, 2106-11. (Ranking: 3/42. IF: 2.299. Cited:3)
10. Cheung KMC, Wong YW, Luk KDK, Leong JCY: Eosinophilic granuloma of the cervical spine. **Chinese Medical Journal**, Vol. 110 (10), 814-16, Oct. 1997. (Rank: 76/103. IF: 0.453. Cited:2)
11. Luk KDK, Cheung KMC: Lumbar spinal instability. **Hong Kong Journal of Orthopaedic Surgery** Vol. 2(2), 164-170, 1998.
12. K.W.K. Yeung, C.Y. Chung, K.M.C. Cheung, W.W. Lu and K.D.K. Luk. Effect of Heat-Treatment on Phase Transition Temperatures of a Superelastic NiTi Alloy for Medical Use. **Material Science Forum** Vol 394-395, 321-324, 2002.
13. Cheung KMC, Zhang JG, Lu DS, Luk KDK, Leong JCY: Ten year follow-up of lower thoracic hemivertebrae treated by convex fusion and concave distraction. **Spine**, Volume 27, Issue 7, April 2002, 748-753. (Ranking: 3/42. IF: 2.299. Cited:4)
14. Cheung KMC, Chen Y(joint first author), Kung HF, Leong JCY, Lu WW, Luk KDK: In vivo new bone formation by direct transfer of adenoviral-mediated bone morphogenetic protein-4 gene. **Biochemical and Biophysical Research communications**. 298, Oct 18, 2002, 121-127. (Ranking: 23/64. IF:2.904. Cited:13)
15. Cheung KMC, Kwan EYC, Chan KYK, Luk KDK: A new halo-pelvic apparatus. **Spine**. Volume 28, Number 3, Feb 1st 2003. 305-308. (Ranking: 3/42. IF: 2.299)
16. Cheung KMC, Kaluarachchi K, Andrew JG, Lu WW, Chan D, Cheah KSE. An externally fixed femoral fracture model for mice. **Journal of Orthopaedic Research**. Vol 21, No. 4, 2003.685-690. (Ranking: 2/42. IF:2.720)
17. Cheung KMC, Zhang YG, Lu DS, Luk KDK, Leong JCY. Reduction of disc space distraction after anterior lumbar interbody fusion with autologous iliac crest graft. **Spine**. Vol 28, No. 13, July 1, 2003.1385-89. (Ranking: 3/42. IF: 2.299. Cited:3)
18. Cheung KMC, Lu DS, Poon AMS, Wang T, Luk KDK, Leong JCY. The effect of melatonin suppression on scoliosis development in chickens by either constant light or surgical pinealectomy. **Spine**, Vol 28, No. 17, September 1st, 2003. 1941-1944. (Ranking: 3/42. IF: 2.299. Cited:3)

19. Cheung KMC, Wang T, Hu YG, Leong JCY. Primary thoracolumbar scoliosis in pinealectomised chickens. **Spine**, Vol 28, No. 22, Nov 15th, 2003. (Ranking: 3/42. IF: 2.299. Cited 1)
20. Yeung, KWK, Poon RWY, Liu XY; Ho JPY; Chung CY; Chu PK, Lu WW, Chan D and Cheung KMC: Investigation of nickel suppression and cyto-compatibility of surface treated NiTi shape memory alloy by using plasma immersion ion implantation. **Journal of Biomedical Materials Research: Part A**. Vol 72A, Issue 3, March 1st, 2005. 238-45. (Ranking: 8/15. IF:1.229. Cited:1)
21. Cheung KMC. Is there a need for Orthopaedic Clinician-Scientists? (Editorial) **J Orthop Surg**. 12(2) Dec 2004. 143-4.
22. Cheung KMC, Lu WW, Luk KDK, Wong CT, Chan D, Shen JX, Qiu GX, Zheng ZM, Li CH, Liu SL, Chan WK, Leong JCY. Vertebroplasty by use of a strontium containing bioactive bone cement. **Spine (Focus Issue)**. Sept 1, 2005. Vol. 30, No.17S. S84-S91. (Ranking: 3/42. IF: 2.299)
23. Coe JD, Cheung KMC. Summary statement on Biomaterials. **Spine (Focus Issue)**. Sept 1, 2005. Vol. 30, No.17S., S75. (Ranking: 3/42. IF: 2.299)
24. Cheung KMC, Wang T, Poon AMS, Carl A, Tranmer B, Hu YG, Luk KDK, Leong JCY. The effect of pinealectomy on scoliosis development in young non-human primates. **Spine** Sept 15, 2005. Vol 30, No. 18. 2009-13. (Ranking: 3/42. IF: 2.299)
25. Cheung KMC, Lu DS, Zhang H, Luk KDK. In-vivo demonstration of the effectiveness of thoracoscopic anterior release using the fulcrum bending radiograph: A report of 5 cases. **European Spine Journal** 15 (Suppl. 5): S578-S582 Nov 2006. published online Dec 2005. (Ranking: 8/42. IF:1.458).
26. Jim J, Noponen-Hietala N, Cheung KMC (joint first authors), Ott J, Karppinen J, Sahraravand A, Luk KDK, Yip SP, Song YQ, Leong JCY, Cheah KSE, Ala-Kokko L, Chan D. Age-Dependent Association Of The *Col9a2* Trp2 Allele With Intervertebral Disc Degeneration, Annular Tears And End-Plate Herniations. **Spine** Dec 15, 2005. Vol 30, No. 24, 2735 – 42. (Ranking: 3/42. IF: 2.299)
27. Yeung KWK, Poon RWY, Liu XY, Ho JPY, Chung CY, Chu PK, Lu WW, Chan D and Cheung KMC. Corrosion resistance, surface mechanical properties, and cytocompatibility of plasma immersion ion implantation-treated nickel-titanium shape memory alloys. **Journal of Biomedical Materials Research: Part A**. August 2005 (online publication date). (Ranking: 8/15. IF:1.229)
28. Yeung KWK, Poon RWY, Chung CY, Liu XY, Chu PK, Chan S, Lu WW, Chan D, Luk KDK, Cheung KMC. Nitrogen plasma immersion ion implanted nickel titanium alloys for Orthopedic use. **Journal of Thin Solid Films**, 488, 20-25. July 2005. (3/19. IF:1.647)
29. Cheung KMC, Song YQ, ChenYQ, Karppinen J, Jim JJT, Yip SP, Ott J, Wong KK, Sham P, Luk KDK, Cheah, KSE, Leong JCY. Association of the Taq I allele in vitamin D receptor with degenerative disc disease and disc herniation in Chinese.

- Spine, 1st May 2006. Vol 31, No. 10. 1143-48. (Ranking: 3/42. IF: 2.299)
30. Chan D, Song YQ, Sham P, Cheung KMC. The genetics of degenerative disc disease **European Spine Journal**. 2006 Aug;15 Suppl 3:S317-25. Epub 2006 Jul 4.
 31. Leung VYL, Chan D, Cheung KMC. Regeneration of intervertebral disc by mesenchymal stem cells: Potentials, limitations, and future direction (Review) **European Spine Journal**. 2006 Aug;15 Suppl 3:S406-13. Epub 2006 Jul 15..
 32. Cheung KMC, Cheng EYL, Chan SCF, Yeung KWK, Luk KDK. Outcome assessment of bracing in adolescent idiopathic scoliosis by the use of the SRS-22 questionnaire. **International Orthopaedics**. Published on line 1st Aug 2006. Print: Vol.31(4) ; August 2007. Pg 507-511.
 33. Poon AMS, Cheung KMC (Joint Corresponding Authors), Lu DS, Leong, JCY. Changes in melatonin receptors in relation to the development of scoliosis in pinealectomised chickens. **Spine**, 15th Aug 2006. Vol. 31, No. 18. 2043-2047. (Ranking: 3/42. IF: 2.299)
 34. Yeung KWK, Lu WW, Luk KDK, Cheung KMC. Mechanical testing of a smart spinal implant locking mechanism based on nickel-titanium alloy. **Spine**, 15th Sept 2006. Vol 31, no. 20. 2296-2302. (Ranking: 3/42. IF: 2.299)
 35. Chan YL, Yeung KWK, Lu WW, Ngan AHW, Luk KDK, Chan D, Wu SL, Liu XM, Chu PK, Cheung KMC. Oxygen and Sodium Plasma-Implanted Nickel-Titanium Shape Memory Alloy: A novel Method to Promote Hydroxyapatite Formation and Suppress Nickel Leaching. **Nuclear Instruments and Methods in Physics Research B**. 257, Apr 2007, 687-691. Published online 17 Jan 2007. (Impact factor: 1.181, ranking: 5 out of 32 in the field)
 36. Cheung WY, Arvinte D, Wong YW, Luk KDK, Cheung KMC. Neurological recovery after surgical decompression in patients with cervical spondylotic myelopathy - a prospective study. **International Orthopaedics**. 32(2): Apr 2008. 273-278. (Published online 19th Jan 2007)
 37. Yeung KWK, Poon RWY, Liu XY, Chu PK, Chung CY, Liu XY, Chan S, Lu WW, Chan D, Luk KDK, Cheung KMC. Nitrogen plasma implanted nickel titanium alloys for orthopedic use. **Surface & Coatings Technology** 201 (Feb 2007) 5607-5612.
 38. Yeung KWK, Poon RWY, Chu PK, Chung CY, Liu XY, Lu WW, Chan D, Chan SCW, Luk KDK, Cheung KMC. Surface mechanical properties, corrosion resistance and cytocompatibility of Nitrogen Plasma-Implanted Nickel Titanium Alloys: A comparative study with commonly used medical grade materials. **Journal of Biomedical Materials Research: Part A**. 2007 Feb 12; [Epub ahead of print]
 39. Virtanen IM, Song YQ, Cheung KMC (Joint First Authors), Ala-Kokko L, Karppinen J, Ho DWH, Luk KDK, Yip SP, Leong JCY, Cheah KSE, Sham P, Chan D. Phenotypic and Population Differences in the Association between CILP and Lumbar Disc Disease. **J Med Genet**. 2007 Jan 12; [Epub ahead of print]

40. Yeung KWK, Chan YL, Lam KO, Liu XM, Wu SL, Liu XY, Chung CY, Lu WW, Chan D, Luk KDK, Chu PK, Cheung KMC. New plasma surface treated memory alloys: Towards a new generation of "Smart" orthopaedic materials. **Materials Science & Engineering C**. Vol 28, Mar 2008. 454–459. Epub 14 April, 2007 (<http://dx.doi.org/10.1016/j.msec.2007.04.023>).
41. Cheung KMC, Senkoğlu A, Alanay A, Genç Y, Lau SSN, Luk KDK. Reliability and Concurrent Validity of the Adapted Chinese Version of Scoliosis Research Society-22 (SRS-22) Questionnaire. **Spine**. 2007 May. Volume 32(10), 1141–1145.
42. Cheung KMC, Wang T, Qiu GX, Luk KDK. Recent advances in the aetiology of adolescent idiopathic scoliosis. **International Orthopaedics**. Published online 16th June, 2007.
43. Aladin DMK, Cheung KMC (joint first author), Chan D, Yee AFY, Jim JJT, Luk KDK, Lu WW. Expression of the *Trp2* Allele of *COL9A2* is associated with alterations in the mechanical properties of human intervertebral discs. **Spine**. Vol 32 (25) December 1, 2007. 2820-26.
44. Cheung KMC. Comparative analysis of pedicle screw versus hybrid instrumentation in adolescent idiopathic scoliosis surgery -- Point of View Statement. **International Orthopaedics**. 2007 May 26; [Epub ahead of print].
45. Yeung KWK, Chan RYL, Lama KO, Wu SL, Liu XM, Chung CY, Chu PK, Lu WW, Chan D, Luk KDK, Cheung KMC. In vitro and In vivo Characterization of Novel Plasma Treated Nickel Titanium Shape Memory Alloy for Orthopedic Implantation. **Surface and Coatings Technology**. Available online 17 August 2007. Published November 2007 (202) 1247-1251. doi:10.1016/j.surfcoat.2007.07.093
46. Chan YL, Wu SL, Liu XM, Chu PK, Yeung KWK, Lu WW, Ngan AHW, Luk KDK, Chan D, Cheung KMC. Mechanical Properties, Bioactivity and Corrosion Resistance of Oxygen and Sodium Plasma Treated Nickel Titanium Shape Memory Alloy. **Surface and Coatings Technology**. 202 (2007) 1308–1312. Available online 17 August 2007. doi:10.1016/j.surfcoat.2007.07.092
47. Cheung KMC, Wu JP, Cheng QH, Ma BSC, Gao JC, Luk KDK. Treatment of stiff thoracic scoliosis by thoracoscopic anterior release combined with posterior instrumentation and fusion: a retrospective study. **The Journal of Orthopaedic Surgery and Research**. 2007 Oct 15;2(1):16 [Epub ahead of print]. <http://www.josr-online.com/content/2/1/16>
48. Ho G, Leung VYL, Cheung KMC, Chan D. The effect of severity of intervertebral disc injury on mesenchymal stem cell-based regeneration. **Connective Tissue Research**. Volume 49, Issue 1 January 2008, pages 15 – 21. (IF=1.123, Orthopedics: Rank=8/43)
49. Song YQ, Cheung KMC (joint first author), Ho DWH, Poon SCS, Chiba K, Kawaguchi Y, Hirose Y, Alini M, Grad S, Yee AFY, Leong JCY, Luk KDK, Yip SP, Karppinen J, Cheah KSE, Sham P, Ikegawa S, Chan D. Association of the Asporin

- D14 allele with lumbar disc degeneration in Asians. **American Journal of Human Genetics**, 2008 March;82(3):744-7.
50. Cheung KMC, Cheng ACS, Cheung WY, Chooi YS, Wong YW, Luk KDK. Right Hip Adduction Deficit is Prevalent in Patients with Adolescent Idiopathic Scoliosis. **Journal of Orthopaedic Surgery**. April 2008; 16(1):24-26.
51. Takemitsu M, Cheung KMC (joint first author), Wong YW, Cheung WY, Luk KDK. C5 Nerve Root Palsy after Cervical Laminoplasty and Fusion with Instrumentation. **Journal of Spinal Disorders and Techniques**. June 2008; 21: 267-272
52. Cheung KMC, Al Ghazi S. Approach-related complications of open and thoracoscopic anterior exposures of the thoracic spine. Accepted for publication. **Journal of Orthopaedic Surgery**, Jan 2008.
53. Leung VYL, Hung SC, Li LC, Wu EX, Luk KDK, Chan D, Cheung KMC. Age-related degeneration of lumbar intervertebral discs in rabbits revealed by deuterium oxide-assisted MRI. **Osteoarthritis and Cartilage**. Vol 16, Oct 2008. 1312-1318. (Ranking 1/43. IF=4.017)
54. Song YQ, Ho DWH, Karppinen J, Kao PYP, Fan BJ, Luk KDK, Yip SP, Leong JCY, Cheah KSE, Sham P, Chan D, Cheung KMC. Association between promoter -1607 polymorphism of MMP1 and Lumbar Disc Disease in Southern Chinese. **BMC Medical Genetics**. April 2008, 9 (1):38. <http://www.biomedcentral.com/1471-2350/9/38>. (IF: 2.65).
55. Cheung KMC. Point of view: Comment on Karatoprak et al.: Comparative analysis of pedicle screw versus hybrid instrumentation in adolescent idiopathic scoliosis surgery. **International Orthopaedics**. Aug 2008, 32: 529.
56. Cheung KMC, Sameera AG. Current understanding of low back pain and intervertebral disc degeneration: epidemiological perspectives and phenotypes for genetic studies [Mini-symposium on Genetic Approaches to disc disease]. **Current Orthopaedics**. Vol 22(4), Aug 2008. 237-244.
57. Ho DWH, Chan D, Cheung KMC, Sham P, Song YQ. Family-linkage and case control association studies [Mini-symposium on Genetic Approaches to disc disease]. **Current Orthopaedics**. Vol 22(4), Aug 2008. 251-258.
58. Sham P, Cherny SS, Kao PYP, Song YQ, Chan D, Cheung KMC. Whole-genome association studies of complex diseases [Mini-symposium on Genetic Approaches to disc disease]. **Current Orthopaedics**. Vol 22(4), Aug 2008. 259-266.
59. Zhou GQ, Yang F, Leung VVL, Cheung KMC. Molecular and cellular biology of the intervertebral disc and the use of animal models. [Mini-symposium on Genetic Approaches to disc disease]. **Current Orthopaedics**. Vol 22(4), Aug 2008. 267-273.
60. Song YQ, Sham P, Cheung KMC, Chan D. Genetics of disc degeneration. [Mini-symposium on Genetic Approaches to disc disease]. **Current Orthopaedics**. Vol

22(4), Aug 2008. 259-266.

61. Luk KDK, Don AS, Chong CS, Wong YW, Cheung KMC. Selection of Fusion Levels in Adolescent Idiopathic Scoliosis Using Fulcrum Bending Prediction. **Spine**. Sept 2008; 33 (20), 2192-2198.
62. Cheung KMC, Yeung KWK, Lu WW, Luk KDK. Prediction of spinal flexibility in adolescent idiopathic scoliosis: A quantitative analysis by in-vivo torsional moment measurements. Submitted to **Spine**. (Ranking: 3/42. IF: 2.299)

B. REFEREED JOURNALS (as co-author)

63. Fang D, Cheung KMC, Ruan D, Chan FL: Computed Tomographic osteometry of the Asian lumbar spine, **Journal of Spinal Disorders**, Vol. 7(4), 307-316, Aug. 1994. (Ranking: 15/41. IF:1.121. Cited:6)
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66. Luk KDK, Cheung KMC, Lu DS, Leong JCY: Assessment of scoliosis correction in relation to flexibility using the Fulcrum Bending Correction Index. **Spine** Vol. 23(21), 2303-07, Nov 1998. (Ranking: 3/42. IF: 2.299. Cited:8)
67. Irwin MG, Cheung KMC, Nicholls JM, Thompson N: Intraarticular injection of ketorolac in the rat knee - effect on articular cartilage and synovium. **British Journal of Anaesthesia** Vol. 80, 837-839, 1998. (Ranking: 4/22. IF:2.469. Cited:6)
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70. Luk KDK, Hu Y, Wong YW, Cheung KMC: Evaluation of various evoked potential techniques for spinal cord monitoring during scoliosis surgery. **Spine**. Vol 26, No. 16 Aug 2001, 1772-77. (Ranking: 3/42. IF: 2.299. Cited:5)
71. Lu WW, Luk KDK, Cheung KMC, Wong YW, Leong JCY: Back muscle contraction patterns of patients with low back pain before and after rehabilitation treatment: An electromyographic evaluation. **Journal of Spinal Disorders** Vol. 14,

- No. 4, 277-82, 2001. (Ranking: 15/41. IF:1.121. Cited:4)
72. Lu WW, Cheung KMC, Li YW, Luk KDK, Holmes AD, Zhu QA, Leong JCY: Bioactive bone cement as a principal fixture for spinal burst fracture – an in vitro biomechanical and morphological study. **Spine** Vol 26, no. 24, 2684-2691, 2001. (Ranking: 3/42. IF:2.2999. Cited:10)
 73. Lu WW, Hu Y, Luk KDK, Cheung KMC, Leong JCY: Paraspinal Muscle Activities of Patients with Scoliosis After Spine Fusion: An Electromyographic Study. **Spine** Volume 27, Issue 11, June 10, 2002, 1180-1185. (Ranking: 3/42. IF:2.299. Cited:1)
 74. Luk KDK, Cheung KMC, Leong JCY: Anterior approach to the cervicothoracic junction by unilateral or bilateral manubriotomy. A report of five cases. **Journal of Bone & Joint Surgery - American Volume**. 84-A(6):1013-7, 2002 Jun. (Ranking: 4/42. IF:1.946. Cited:2)
 75. 杨柳, 罗卓荆, 颀强, 靳小兵, WD Hui, Chan D, Huang JD, Cheung KMC, Cheah KSE. Biological Characters of Chondrocytes of Hereditary Multiple Exostosis. **The Orthopedic Journal of China**. Vol.11 No.22, 1543-1546. 2003.
 76. 杨柳, 罗卓荆, 颀强, 靳小兵, WD Hui, Chan D, Huang JD, Cheung KMC, Cheah KSE. Culture of chondrocytes of hereditary multiple exostosis in vitro. **Chinese Journal of Clinical Rehabilitation**. Vol.7 No.26. 3590-3591. 2003.
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Research.

C. BOOK CHAPTERS AND INVITED ARTICLES

1. Cheung KMC, Luk KDK: Role of BMP in bone incorporation. Book Chapter in *Advances in Tissue Banking – Vol. 5: The Scientific Basis of Tissue Transplantation*. Editors: GO Philips and A Nather. World Scientific. Dec 2001.
2. Cheung KMC, Leong JCY. Adult spinal tuberculosis. Book chapter. *Inflammatory Diseases of the Spine (1st Ed)*. Editors: S Govender, JCY Leong. TTG Asia Media Pte Ltd, Singapore. Aug 2003. Pg.11-1 to 11-16.
3. Cheung KMC, Leong JCY. Spinal instrumentation overview in lumbar degenerative disorders: Cages. Book Chapter in *The Lumbar Spine (3rd Edition) – ISSLS textbook*. Editors: HN Herkowitz, J Dvorak, G Bell, M Nordin, D Grob. Lippincott Williams & Wilkins. May 2004.
4. Cheung KMC, Leung VYL. Rebuilding the degenerated intervertebral discs by bone marrow stem cells. *The Hong Kong Medical Diary*. Vol 12, No. 4 Apr 2007. 28-29.
5. Cheung KMC, Ji Q, Luk KDK. Scheuermann's Disease. Book Chapter for *Chinese Textbook of Spinal Surgery*. Editor: SX Hou.
6. Senkoylu A, Cheung KMC, Luk KDK: Cervical myelopathy. Book chapter for *Degenerative Spinal Conditions* (published in Turkish). Editors T Yazar and N Altun. Publisher: Rekmay Yaymcilik. 2007
7. Cheung KMC, Fan BJ, Karppinen J, Leong JCY, Luk KDK. Can age-related intervertebral disc changes be differentiated from degenerative disc disease? Book chapter for *Low Back Pain: Controversies in Clinical Practice and Research*. Publisher: Rehabilitation Orton Invalid Foundation, Helsinki. Editor: Karl-August Lindgren. 2008.

D. PATENTS

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2. Cheah KSE, Cheung KMC, Chan D: Uses of transgenic animals containing a type X collagen mutant. **Full European patent**. 8th October 1999. Serial no. 1159423.
3. Cheah KSE, Cheung KMC, Chan D: DNA encoding mutated collagen X. **U.S. Non-Provisional Patent**. No. 6,828,433. Issue date: 7th December 2004. Serial no. 09/975,607, filed on 11th October 2001.
4. Li Yiwen, Lu WW, Cheung KMC, Luk KDK, Leong CY: Bioactive And Osteoporotic Bone Cement. **U.S. Non-Provisional Patent** (No.6593394B1). Filed: July 15, 2003.

5. Cheung KMC, Yeung, KWK, Chung JCY, Lu WW: Device for correcting spinal deformities. **U.S. Non-Provisional Patent** (No. 10/648,158). Filed: Aug 25, 2003.
6. Cheung KMC, Yeung, KWK, Chung JCY, Lu WW: Fixation Device. **U.S. Non-Provisional Patent** (10/827,664). Filed April 19th 2004.
7. Cheung KMC, Yeung, KWK, Chung JCY, Lu WW: Shape memory material and method of making the same (Heat treatment protocol). **U.S. Non-Provisional Patent** (10/827,665). Filed April 19th 2004. Publication date: 30 December 2004.
8. Yuan B, Chung JCY, Yeung KWK, Cheung KMC: Pseudoelastic porous shape memory materials for biomedical and engineering applications. **US Non-Provisional Patent. No. 11/534,275**. US filing date 22nd Sept 2006.
9. Cheung KMC, Yeung, KWK, Chung JCY, Lu WW: Shape memory material and method of making the same (Heat treatment protocol). **Japan Non-Provisional Patent** (Publication no. 2006-523770). Publication date: 19th October, 2006.
10. Cheung KMC, Yeung, KWK, Chung JCY, Lu WW: Device for correcting spinal deformities. **Chinese Non-Provisional Patent** (No. 03824606.6). Filed: 16 November, 2005.
11. Yeung KWK, Poon RWY, Chu PKH, Cheung KMC, Lu WW: Surface treated shape memory materials and methods for making same. **US non-provisional patent** filed 11 Jan 2006, provisional patent filed January 13, 2005. (Serial No. 60/643,744)
12. Yuan B, Chung CY, Ho JPY, Zhu M, Yeung KWK, Cheung KMC. **US provisional patent** filed 23 September 2005. (appl no. 60/719,995).
13. Cheung KMC, Yeung KWK. **US Regular pattern**. US2008 0065074-A1. A memory locking device for orthopaedic implants.

INTERNATIONAL CONFERENCE AND WORKING PAPERS

210 oral, poster and video presentations at international conferences (full list available on request).

SERVICE AND ADMINISTRATION

POSITIONS OF RESPONSIBILITIES

A. Local

1. Honorary Treasurer, Hong Kong College of Orthopaedic Surgeons 2005 to 2007.
2. Chairman of the organizing committee, The Hong Kong Orthopaedic Association Annual Congress 2004.
3. Honorary Clinical Supervisor of Basic Trainees in Family Medicine (2006-2009)

B. International

1. Board of Directors, Scoliosis Research Society (2008-2010)
2. AOSpine International, Executive Research Officer (2006-2008).
3. Chairman, AOSpine Research Commission (2006-2008).
4. Chairman, AOSpine International Spine Course 2005, Davos, Switzerland.
5. Co-Chairman, Expert Group on spinal deformities, AOTK (2005-2006).
6. Chair-elect, Awards & Scholarship Committee, Scoliosis Research Society (2005-2006).
7. Chairman, Awards & Scholarship Committee, Scoliosis Research Society (2006-2007).
8. Past-chairman, Awards & Scholarship Committee, Scoliosis Research Society (2007-2008).
9. Member of Research Grant Committee, Scoliosis Research Society (2005 to 2007).
10. Chairman of Research Grant Committee, Scoliosis Research Society (2007 to 2008).
11. Member of Evidence Based Medicine Committee, Scoliosis Research Society (2007 to 2008).
12. Member of Committee of 3-D classification for spinal deformities, Scoliosis Research Society (2004 to 2007).
13. Research Mentor for the Scoliosis Research Society since 2005.
14. Conference chairman: World Forum for Spine Research, Kyoto, Japan. Jan 2008.
15. International chairman of organizing committee, International meeting on advanced spine techniques (IMAST) July 2008 (Hong Kong).
16. Member of International Affairs Advisory Board, Scoliosis Research Society (2008 to 2009).

CLINICAL PRACTICE

I completed my specialist training in Orthopaedic Surgery and have been accredited by the Hong Kong Academy of Medicine in 1995. I spend approximately 50% of my time in clinical practice and 50% in pursuing research.

My current clinical practice is exclusively in Spine Surgery. I am the deputy chief of the Division in the Department of Orthopaedics and Traumatology, the University of Hong Kong. I work predominantly in two hospitals: The Duchess of Kent Children's Hospital and Queen Mary Hospital. I see and operate on patients with the full range of spinal pathologies, from trauma to degeneration, deformities and tumour. I am competent and independent in the handling of most major spine surgeries, and also supervise residents and trainees during their rotation in the Division.

PROFESSIONAL APPOINTMENTS (IN CHRONOLOGICAL ORDER)

Jan 06 - Present	Clinical Professor Honorary Consultant Orthopaedic Surgeon Deputy Chief, Division of Spine Surgery Department of Orthopaedics & Traumatology The University of Hong Kong Queen Mary Hospital and The Duchess of Kent Children's Hospital Hong Kong
Feb 02 - Dec 05	Associate Professor (Senior Lecturer) Honorary Consultant Orthopaedic Surgeon Deputy Chief, Division of Spine Surgery Department of Orthopaedics & Traumatology, The University of Hong Kong.
March 97 - Jan 02	Associate Professor and Honorary Consultant Orthopaedic Surgeon, Department of Orthopaedics & Traumatology, The University of Hong Kong.
July 96 - Feb. 97	Assistant Professor and Honorary Senior Medical Officer Department of Orthopaedic Surgery, The University of Hong Kong
Apr.92 - June 96	Lecturer and Honorary Senior Medical Officer Department of Orthopaedic Surgery, The University of Hong Kong
Aug 91 - Jan 92	Senior House Officer in Head & Neck Surgery and Vascular Surgery, Westminster Hospital, London, U.K.
Jan 91 - Jul 91	Senior House Officer in Orthopaedics, Westminster Hospital, London, UK.
Jan 90 - Jan 91	Senior House Officer in General Surgery, Plastic Surgery, Urology, Southend General Hospital, Southend-on-Sea, U.K
Aug 89 - Jan 90	Senior House Officer in Orthopaedics, Mount Vernon Hospital, Harrow, UK.
Feb 89 - Jul 89	Senior House Officer in Accidents & Emergency Department University College Hospital, London, UK.
Aug 88 - Jan 89	Senior House Officer in Orthopaedics. Royal National Orthopaedic Hospital, Stanmore, UK.
Feb 88 - Aug 88	House Officer in General Medicine, Harold Wood Hospital, UK.

Nov 87 - Jan 88	House Officer in General Surgery, St. Bartholomew's Hospital Medical College, London, UK.
Aug 87 - Nov 87	House Officer in Orthopaedic Surgery, St. Bartholomew's Hospital Medical College, London, UK.

PROFESSIONAL DEVELOPMENT

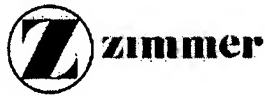
MEMBERSHIPS OF PROFESSIONAL BODIES AND ESTEEMED SOCIETIES

1. Asian Association for Dynamic Osteosynthesis
2. Hong Kong Academy of Medicine
3. Hong Kong College of Orthopaedic Surgeons
4. Hong Kong Orthopaedic Association
5. Royal College of Surgeons of England
6. Scoliosis Research Society (Candidate member from 1999, active member since 2004)
7. SICOT (Société Internationale de Chirurgie Orthopédique et Traumatologique)
8. Asia Pacific Orthopaedic Association
9. Asia Pacific Orthopaedic Association, Spinal Section
10. Centre of Development and Birth defects, The University of Hong Kong.
11. Center of Endocrinology and Diabetes, The University of Hong Kong
12. Board member of Chinese Speaking Orthopaedic Society (CSOS) (2004-2006)
13. Hong Kong Society for Developmental Biology (2004-)
14. Honorary member, North American Spine Society (2008-)

POSTGRADUATE TRAINING IN SPINAL SURGERY (MAY TO OCTOBER 1996)

I spent five months in 1996 visiting various spine centers around the world, each with a particular expertise, gaining valuable experience in this field.

1. Prof. K Tomita. Kanazawa University Hospital, Kanazawa, Japan.
2. Prof. K Kaneda. Hokkaido University Hospital, Sapporo, Japan.
3. Dr. D Bradford and Dr. S Hu. UCSF Medical Center, San Francisco, USA.
4. Dr. J Kostuik. Johns Hopkins University Hospital, Baltimore, USA.
5. Dr. H Yuan. Syracuse University Hospital, Syracuse, USA.
6. Mr. A Ransford. The Royal National Orthopaedic Hospital, Stanmore, UK.
7. Prof. J Dubousset and Dr. R Zeller. Hôpital St. Vincent de Paul, Paris, France
8. Prof J Harms. Klinikum Karlsbad-Langensteinbach, University of Heidelberg, Germany.



Dynesys® Dynamic Stabilization System: A Guide for Patients

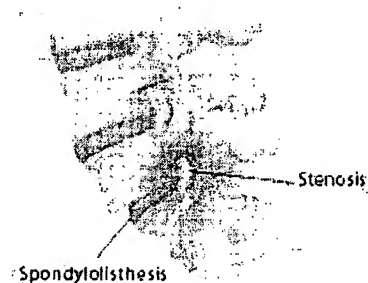
The *Dynesys* Dynamic Stabilization System is a new concept in the surgical treatment of lower back and leg pain -- one that uses flexible materials to stabilize the spine and offers another approach to traditional fusion.

If your doctor has recommended fusion surgery, the *Dynesys* System may be an option. It can help provide added stability and keep the vertebrae in a more natural position than can be achieved with conventional surgery alone.

This information is provided to help you make an informed decision about your spine surgery. If you have any additional questions, please ask your physician as he or she is the only one qualified to comment on your specific condition.

What causes lower back and leg pain?

If you are suffering from lower back or leg pain, you are not alone. The majority of people will suffer from one or both at some point in their lives. View additional information



When a disk degenerates, the space between the vertebrae narrows. This narrowing can pinch the nerves and cause pain.

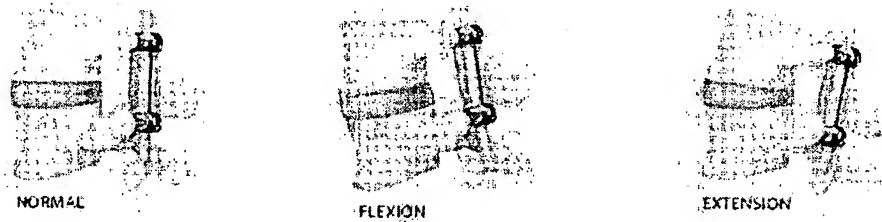
What treatments are available?

Chronic lower back and leg pain is usually treated non-surgically for as long as possible with rest, ice or heat, weight control, exercise, physical therapy, medication and injections.

However, when these methods fail to result in pain relief and a return to normal daily activities, a surgical spinal fusion may be recommended to restore the spine's alignment and the spacing between vertebrae. This procedure helps to remove pressure from the nerves, reducing or eliminating the pain. In the past, the traditional procedure removed the affected discs and fused the vertebral segments together, eliminating movement and providing stability.

How can the *Dynesys* System help?

The *Dynesys* System is a pedicle-screw fixation system, an implant device consisting of a spacer, cord and pedicle screw. It offers a unique approach to stabilization and mobilization of the spine and pain relief -- a "dynamic" approach -- that relies on flexible materials and preserves much of the spinal anatomy.



At rest: The *Dynesys* System supports an intervertebral joint

Flexion: The *Dynesys* System supports the affected joint as the spine bends forward

Extension: It also supports the joints as the spine bends backwards

Which patients are candidates for the *Dynesys* System?

The *Dynesys* System can be used in skeletally mature patients to provide immobilization and stabilization of spinal segments. It is used as an adjunct to fusion to treat degenerative slipped disc(s) (spondylolisthesis) in the thoracic, lumbar or sacral regions when there is evidence of resulting neurologic impairment or in the case of a previous failed fusion (pseudarthrosis).

When should the *Dynesys* System not be used?

The *Dynesys* System should not be used in the cervical spine or for patients that are obese, pregnant, abuse alcohol or other drugs, or who have:

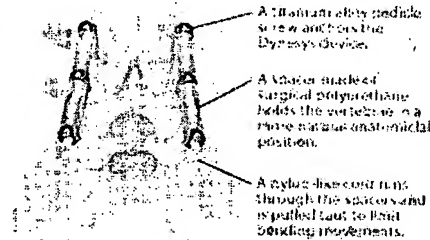
- an active or systemic infection
- mental illness
- severe osteoporosis or osteopenia
- sensitivities or allergies to metals, polymers, polyethylene, polycarbonate urethane and polyethylene terephthalate
- soft tissue deficit
- congenital abnormalities
- tumors
- inadequate pedicles of the thoracic, lumbar and sacral vertebrae

The *Dynesys* System is also not appropriate for individuals with any medical or mental condition that puts them at high risk from surgery of this severity, those with a condition that will not allow them to benefit from the surgery or decrease the useful life of the device, and those who are unwilling or unable to follow post-operative instructions.

What does surgery with the *Dynesys* System involve?

The *Dynesys* System is compatible with conventional surgical techniques, and in some cases can be implanted using a minimally invasive approach. On average, the procedure to implant the *Dynesys* System takes two to three hours which is similar to the time required for traditional fusion procedures.

During the procedure, the surgeon removes portions of the affected disc(s) and bone from the spine. The *Dynesys* System is then attached to the bony extrusion (pedicle) on each side of the affected vertebrae. Once in place, the components create a dynamic push-pull relationship that stabilizes the affected joints and keeps your vertebrae in a natural position. Bone is the most commonly used material to help promote fusion and will be added to achieve the desired fusion.



What happens after surgery?

It may take several weeks to fully recover from pain resulting from the surgery. However, you may feel almost immediate relief of any leg pain. Back pain should diminish over time now that the vertebrae have been stabilized and nerves are no longer compressed. In most cases, a short hospital stay is required to ensure you adjust to oral pain medication and can move without any problems. Most patients return home within a few days.

Following your surgery, your doctor will prescribe rehabilitation and follow-up visits as needed. It's important to follow your physician's instructions carefully to help ensure a full and quick recovery.

Are complications possible?

Surgery always involves some risk. General surgical complications may include:

- reactions to anesthesia
- heart attack
- infection
- blood vessel damage/bleeding
- bruise (hematoma)
- pneumonia
- blood clots
- wound closure problems
- death

Potential risks associated with the implantation of the *Dynesys* System are similar to those associated with any spinal fusion procedure and those risks specific to the implantation of other pedicle-screw systems. They may include:

- tear in the outer lining of the spinal cord which may result in spinal fluid leakage
- temporary decreased or absent intestinal function
- implant migration
- leg pain
- nerve complications
- fractured sacrum

Please consult with your surgeon for a complete list of all warnings and precautions.

The safety and effectiveness of the *Dynesys* System has not been established for indications beyond those stated here -- including spinal stabilization without fusion.

Following surgery, please contact your doctor if you experience any of the following symptoms:

- signs of infection such as fever, chills, redness around the incision, or a feeling of pressure in the spine
- bleeding or excessive drainage from the incision
- sudden pain or a significant increase in pain
- loss of feeling in your hands or feet
- increased or ongoing shortness of breath

How can I improve my chances of a good outcome?

It's well known that smokers experience lower surgery success rates than non-smokers. If you smoke, please consider stopping as far in advance of surgery as possible. In addition, poor nutrition impacts your body's ability to heal itself. Eat well-balanced, nutritional meals as far in advance of surgery as possible.

What if I have more questions?

This web site is provided to give you information about your treatment options, but it is not intended to replace professional medical care or provide medical advice. If you have any further questions or need additional information about the *Dynesys* System, please call or see your doctor, who is the only one qualified to diagnose and treat your condition.

Quick Link

Find a Doctor

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medical professional. You should always consult a professional medical adviser, such as a physician, to determine what courses of treatment, if any, may be appropriate for you.